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10/720,059	11/25/2003	Andrej S. Mitrovic	071469-0306508 (PC0187A)	4196
69792 7590 08/23/2007 TOKYO ELECTRON U.S. HOLDINGS, INC. 4350 W. CHANDLER BLVD. SUITE 10 CHANDLER, AZ 85226			EXAMINER FORD, NATHAN K	
			ART UNIT 1762	PAPER NUMBER
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

## Office Action Summary

Application No.

10/720,059

Applicant(s)

MITROVIC, ANDREJ S.

Examiner

Nathan K. Ford

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1709

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 25 November 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-40 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-40 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☒ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 25 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date 11/25/03, 5/14/04.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_.

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## DETAILED ACTION

### *Election/Restrictions*

Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1-40, drawn to a plasma processing system, classified in class 118, subclass 723R.
- II. Claims 41-58, drawn to a method of measuring concentrations in a plasma processing system, classified in class 427, subclass 248.1.

Inventions II and I are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another and materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process [MPEP § 806.05(e)]. In this case, the apparatus can be availed for processing substrates without measuring species concentrations.

During a telephone conversation on July 9, 2007, Tugrul Yasar made a provisional election without traverse to prosecute the invention of Group I, claims 1-40. Applicant in replying to this Office action must make affirmation of this election. Claims 41-58 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Restriction for examination purposes as indicated is proper because all these inventions listed in this action are independent or distinct for the reasons given above and there would be a serious search and examination burden if restriction were not required because one or more of the following reasons apply:

- (a) the inventions have acquired a separate status in the art in view of their different classification;
- (b) the inventions have acquired a separate status in the art due to their recognized divergent subject matter;
- (c) the inventions require a different field of search (for example, searching different classes/subclasses or electronic resources, or employing different search queries);
- (d) the prior art applicable to one invention would not likely be applicable to another invention;
- (e) the inventions are likely to raise different non-prior art issues under 35 U.S.C. 101 and/or 35 U.S.C. 112, first paragraph.

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Applicant is advised that the reply to this requirement to be complete must include (i) an election of a invention to be examined even though the requirement may be traversed (37 CFR 1.143) and (ii) identification of the claims encompassing the elected invention.

The election of an invention may be made with or without traverse. To reserve a right to petition, the election must be made with traverse. If the reply does not distinctly and specifically point out supposed errors in the restriction requirement, the election shall be treated as an election without traverse. Traversal must be presented at the time of election in order to be considered timely. Failure to timely traverse the requirement will result in the loss of right to petition under 37 CFR 1.144. If claims are added after the election, applicant must indicate which of these claims are readable on the elected invention.

If claims are added after the election, applicant must indicate which of these claims are readable upon the elected invention.

Should applicant traverse on the ground that the inventions are not patentably distinct, applicant should submit evidence or identify such evidence now of record showing the inventions to be obvious variants or clearly admit on the record that this is the case. In either instance, if the examiner finds one of the inventions unpatentable over the prior art, the evidence or admission may be used in a rejection under 35 U.S.C. 103(a) of the other invention.

#### ***Specification Objections***

Paragraph thirty-two designates the chamber as element 18; element 18 had previously designated the plasma. Correction is required.

#### ***Claim Objections***

Claim 28 is objected to for failing to properly introduce the "drive mechanism." The claim refers to the mechanism as "*the* drive mechanism"; however, the drive mechanism had not yet been introduced in the claims upon which claim 28 depends. Either the claim dependency must be amended, or the mechanism should be designated as "*a* drive mechanism." To facilitate examination, claim 28 will be read as dependent upon claim 27.

#### ***Claim Rejections - 35 USC § 102***

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The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1 and 5 are rejected under 35 U.S.C. 102(b) as being anticipated by Gupta et al., US 6,125,789.

Gupta teaches the following:

- A chamber (15) with a space for processing plasma;
- A chuck (12) for supporting a substrate within the chamber;
- A generator (410) that effects a magnetic field within the chamber (10, 33-35);
- A plasma generator (44) in communication with the chamber (5, 10-17);
- A sheet optic element (335) in communication with the chamber (8, 33-40);
- A laser light source (330) operatively associated with the sheet optic element;
- An imaging device (345) configured to acquire image data corresponding to the particles illuminated by the light sheet (340) (8, 35-40; 9, 1-5);
- An image processor in communication with the imaging device configured to process the image data to obtain a concentration of the particles in the light sheet (6, 33-44; 9, 1-7);
- Since the magnetic field generator, optic element, and imaging device are each fixed, they are positioned relative to one another to access the plasma, i.e., if the position of one element is known, so are the positions of the other two.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 2, 4, and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gupta in view of Dybas et al., US 5,255,089.

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Claim 2: Gupta teaches a sheet optic element that includes a lens but does not teach its shape. Dybas teaches an optic element to detect particles in a plasma system; the optic element includes a cylindrical lens to control the vertical spread of light (6, 43-52). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to conceive Gupta's lens in a cylindrical shape as disclosed by Dybas to control the vertical spread of light.

Claim 4: Gupta does not teach a scanning mirror. Dybas teaches a scanning mirror (36) operating cooperatively with the sheet optic element to produce and direct the light sheet into the plasma processing area (5, 28-36). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Gupta's apparatus with the scanning mirror taught by Dybas to direct the light sheet into the plasma processing area.

Claim 6: Gupta teaches a photosensor, but does not describe the device as a camera. Dybas, however, teaches a camera to monitor the light scattered by the particles within the plasma chamber (Abstract). Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to augment the optic devices of Gupta with the camera of Dybas to monitor the light scattered by the particles within the plasma chamber.

Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gupta in view of Borden, US 4,896,048.

Gupta does not teach an optic element including both a cylindrical and spherical lens. Borden, disclosing a plasma particle detector, teaches the concurrent use of a spherical lens and a cylindrical lens to collimate the light beam and beget a high intensity, wide-area beam for the detection of particles (3, 34-39). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Gupta's optic element in the manner taught by Borden to conceive a collimated, wide-area beam for the detection of plasma particles.

Claims 7-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gupta in view of Masuda et al., US 2001/0015175.

Claim 7: Gupta teaches a magnetic field generator but not the applicant's claimed configuration. Masuda discloses a plasma processing system that includes a magnetic field generator (101). The generator is annular and external to the chamber, which engenders a magnetic field having a specifiable distribution and strength (Fig. 1; [0061]). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to

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arrange Gupta's field generator in the manner taught by Masuda to effect a magnetic field having a specifiable distribution and strength.

Claim 8: If the combination under claim 7 were adopted, Gupta's optic element and imaging device would be positioned above the magnetic field generator (Fig. 1A).

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gupta in view of Masuda and in further view of Haruta et al., US 6,033,741.

Gupta does not teach movable lenses. Haruta, disclosing plasma processing apparatus, teaches an embodiment wherein a sheet optic lens (19) is movably disposed to form a film over a wide area (Fig. 22; 29, 45-65). As the figure and description indicate, light sheets are formed at multiple planes in the chamber.

In Gupta's apparatus, the emitted light sheet must pass through windows of discrete size and target reduced volumes (418) (10, 43-58; Fig. 4B). Accordingly, Gupta teaches the need to "direct" the sheet emitted by the light source along a specific path. Availing Haruta's mechanism to manipulate the sheet optic elements of Gupta would enable the latter to achieve greater focal precision. Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made for Gupta to manipulate the sheet optic elements as taught by Haruta to improve the focal precision of Gupta's light sheet.

Gupta does not address the mounting of the sheet optic element; however, Figures 3A and 3B indicate that the optic elements are positioned external to the chamber – the light enters the chamber interior through a window (341). Nevertheless, since the applicant does not address how the relocation of Gupta's optic element from the chamber exterior to an internal wall would effect a result that would be considered non-obvious by a person of ordinary skill, the modification qualifies as a mere rearrangement of parts, which requires only routine skill in the art and is thereby unpatentable (*In re Japikse*, 86 USPQ 70).

Claims 10-11, 15, 18-21, 26-28, 33, and 37-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gupta in view of Haruta.

Claim 10: Gupta does not teach additional optic elements. Haruta teaches multiple sheet optic elements (9a, 9b, 4001a, 4001b) disposed at separate locations to beget unique focal points and illuminate additional planes within the

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chamber (Fig. 44; 39, 19-35). Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to augment Gupta's solitary lens with Haruta's multiplicity at separate locations to redirect light entering the chamber at multiple points.

Claim 11: Gupta's photo sensor is capable of acquiring image data from illuminated plasma particles, regardless of the number of light sheets contacting the plasma.

Claim 15: Gupta does not teach an additional light source. Figure 51 of Haruta delineates two light sources (10) each corresponding to a respective sheet optic element to target multiple areas (43, 9-20). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to augment the apparatus of Gupta with an additional light source as taught by Haruta to target multiple areas.

Claim 18: Gupta's first sheet optic element and imaging device are fixedly mounted. Haruta, who introduced additional sheet optic elements in combination with Gupta under claim 10, does not explicitly designate the elements recited in this claim as "fixedly mounted." However, demonstrated under claim 9 was Haruta's capability to control the movement of the lenses. Accordingly, Haruta could maintain the lenses in a fixed position.

Claim 19: This claim is rejected for the reasons provided under claim 9.

Claim 20: Haruta teaches reflecting lenses that can be rotated about an optical axis to target light sheets at multiple planes within the chamber (33, 8-33; Figs. 33A, 33B). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to augment the sheet optic element of Gupta with the rotary means taught by Haruta to target light sheets at multiple planes within the chamber.

Claims 21, 27-28: Although Haruta does not claim a drive mechanism explicitly, such a mechanism must be present inherently to effect the rotation of the reflecting mirrors.

Claim 26: Haruta, in Figure 22, disposes a lens (19) to move arcuately, thereby rotating the light sheet through multiple planes in the chamber (See explanation under claim 9).

Claim 33: Gupta provides a light source configured to emit light through an optical window (3, 32-38).

Claims 37-38: Gupta does not teach shutters. Haruta employs a shutter (4234) to obviate contaminant deposition on the sheet optic element (88, 11-24; Fig. 138). The figure only delineates one shutter corresponding to one light source. However, given that Haruta has previously disclosed embodiments teaching multiple light sources, it would be obvious to supplement the additional light sources with shutter to maintain the one shutter to one light source



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correspondence taught by Figure 138. It would have been further obvious to one of ordinary skill in the art at the time the invention was made to employ the shutter of Haruta contiguous to the sheet optic element of Gupta to obviate contaminant deposition on the lenses of the element. In combination with the shutter of Haruta, Gupta's imaging device would be capable of acquiring data on each light sheet to facilitate particle measurement.

Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gupta in view of Haruta and in further view of Liu, US 6,303,903.

Gupta does not teach a color filter. Liu, disclosing an apparatus capable of plasma imaging, employs a laser (102) that directs a light sheet through a color filter (128) to narrow the spectral bandwidth of the plasma emission, which in turn reduces the chromatic aberration of the image system (2, 60ff). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to employ the filter of Liu contiguous to the light source of Gupta to narrow the spectral bandwidth of the plasma emission.

Claims 12-14, 16, and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gupta in view of Haruta and in further view of Dybas.

Claims 12, 16, 36: Gupta is silent regarding the color of the emitted light sheets. Dybas teaches multiple particle-detecting lasers respectively generating a red, green, or blue light (claim 9). Color corresponds to wavelength according to well-known physical correlations. Thus, by generating various colors, the laser is also generating various wavelengths thereby allowing particle distinguishment (5, 1-9). It would have been obvious to one of ordinary skill in the art at the time the invention was made to augment Gupta with the lasers of Dybas to facilitate means of particle differentiation.

Claim 13: Dybas teaches an image processor that can distinguish the illuminated particles by color (6, 55ff; 7, 1-28).

Claim 14: Under claim 2 Dybas described the optic elements of his apparatus as including cylindrical lenses.

Claims 22-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gupta in view of Haruta and in further view of Alfano et al., US 6,108,576.

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Gupta does not teach the imaging requirements specified by claims 22-25. Alfano, teaching three-dimensional imaging in a highly scattered turbid environment, arranges multiple source detectors, i.e., cameras, in an intersecting manner to engender a three-dimensional image. The detectors receive the light pulse emitted from the turbid media, in this case the plasma, and output a two-dimensional image. An inverse algorithm derives the three-dimensional image (4, 1-65). An image processor is available to deproject the image based on the received angular data from the detectors (5, 20-25; 12, 15-27). Although not stated explicitly, the detection instruments have the inherent capacity to obtain angular data corresponding to an imaging angle of the optic element relative to the chamber. Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to augment Gupta's apparatus with the imaging cameras taught by Alfano to capture three-dimensional images of plasma, thereby facilitating the improved analysis of the species.

Claims 29-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gupta in view of Cartz et al., US 4,504,964.

Claim 29: Gupta does not provide his magnetic field generator with a passageway. Cartz, disclosing a device for effecting plasma, teaches an electrode outfitted with passageways for a laser beam to pass therethrough (2, 35-43; Fig. 2). Cartz uses the electrode to control the circumferential dispersal of the light beams. The electrode generates a magnetic field (2, 44-56). It would have been obvious to one of ordinary skill in the art at the time the invention was made to insert passageways in the magnetic field generator of Gupta and pass light through as taught by Cartz to manage the dispersal of light.

Claim 30: The lasers of Cartz are disposed external to the chamber and configured to emit light through the passageway (Fig. 1).

Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gupta in view of Cartz and in further view of Sato et al., US 5,748,275.

Gupta does not teach a shield between the light source and plasma generator. Sato teaches a shield (29) disposed contiguously to a light source (15) to deflect unnecessary scattered light (18, 58ff; Fig. 16). Thus, it would

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have been obvious to one of ordinary skill in the art at the time the invention was made to dispose the shield of Sato approximate to the light source of Gupta to deflect unnecessary scattered light.

Sato does not teach the shield's placement between the plasma generator and the light source. However, the shield must be disposed next to a light source to function; thus, it would have also been obvious to dispose the shield of Sato adjacent to the light source of Gupta. As disposed in Gupta's arrangement given this necessity, the shield would be between the light source and plasma generator.

Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gupta in view of Cartz and in further view of Haruta for the reasons given under claim 9.

Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gupta in view of Haruta and in further view of Katsumata, US 5,851,842.

Gupta does not teach a beam splitter. Katsumata, disclosing a measurement apparatus effective for plasma systems, teaches one colored light source (131) corresponding to one beam splitter (132) (22, 19-21). Under claim 15 it was obvious to augment Gupta with multiple light sources. Given Katsumata's one-to-one correspondence of light source to beam splitter, it would have been obvious to one of ordinary skill in the art at the time the invention was made to correlate each light source of Gupta with one beam splitter as taught by Katsumata to split the laser light into two components (22, 2-3). As disposed in the apparatus of Gupta, the split laser beams would then be provided to separate optic elements.

Regarding the placement of the splitter, Figure 21 of Katsumata delineates the splitter (132) configured between the light source and the optic window (123), rather than the claimed orientation – the optic window configured between the light source and beam splitter. Nevertheless, absent of a compelling reason for the transposition of Katsumata's optic window and beam splitter, the applicant's modification is nothing more than a mere rearrangement of parts. It would have been obvious to one of ordinary skill in the art at the time the invention was made to transpose Katsumata's optic window and beam splitter, since it has been held that rearranging parts of an invention involves only routine skill in the art (*In re Japikse*, 86 USPQ 70).

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Claims 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gupta in view of Haruta and in further view of Takeishi et al., US 6,425,801.

Gupta does not designate his light source as a "multi-line laser." Takeishi, disclosing a substrate monitoring apparatus, uses a multi-line laser to generate a detection light beam, thereby indicating the laser's suitability for detection purposes (20, 10-19; 20, 26-35). Thus, it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute Masuda's unspecified laser with the multi-line laser of Takeishi given the latter's indication as to the suitability of the device for detection purposes.

Claims 39-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gupta in view of Haruta and in further view of Katsumata and Liu.

Under claim 34, it was obvious to combine the beam splitter of Katsumata with the apparatus of Gupta. Further, under claim 17, it was obvious to employ the color filter of Liu to selectively transmit wavelengths therethrough to narrow spectral bandwidth of the plasma emission, which in turn reduces the chromatic aberration of the image system (2, 60ff – Liu). Collectively, Katsumata's beam splitter and Liu's color filter compose the "at least one filter" recited in claims 39 and 40. In combination, Gupta's light source would transmit light to the splitter of Katsumata, which would direct the light sheet to the multiple color filters of Liu. In turn, Liu's filters would separate the light so a different colored light beam would be provided to the plurality of sheet optic elements. It would have been obvious to one of ordinary skill in the art at the time the invention was made to augment Gupta with the collective filter of Liu and Katsumata to separate the wavelengths of a light sheet so each spectrum component can be isolated and measured.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nathan K. Ford whose telephone number is 571-270-1880. The examiner can normally be reached on M-F, 8:30-5:00 EDT. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on 571-272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

nkf

  
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